

MEASUREMENT OF THE ENERGY METABOLISM OF DAIRY COWS USING THE
TRADITIONAL FACE MASK SYSTEM

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Calorimetric measurements are normally made in respiration chambers but the face mask has some advantages for short-term measurements of energy exchange of large animals. It is inexpensive and measurements can be made on animals in pens.

Three energy exchange experiments on dairy cows and heifers were conducted with a Chinese-made traditional open-circuit mask system in a thermoneutral zone on a dairy farm near Beijing.

Experiment 1: The fasting metabolism of 4 adult, non pregnant, dry Chinese Holstein cows was measured on days 4-6 of fasting. The expired air from the cows was collected for 5-8 mins at 0200 h, 0800 h, 1400 h and 2000 h each day. The composition of the collected air was analysed with Haldane apparatus, The heat production was calculated using Brouwer's (1965) formula. The average 24h heat production calculated from the summation of each collection period was 72.1 Kcal W^{0.75}.

Experiment 2: The fasting metabolism of four groups of 3 Chinese Holstein growing heifers (9-18 months of age) was measured. The age intervals between the groups was 3 months, The experimental method was the same as that used in experiment 1. The fasting heat production of heifers aged 12-18 months at fasted body weight of 190-320 kg was 277.5 Kcal W^{0.53} per day. A large effect of age on fasting metabolism was evident, and the statistically significant regression of fasting heat production (FM) on age (t, months) was:

$$FM = 150.9 e^{(-0.0405t)} W^{0.75}$$

Experiment 3: The heat production of 3 early pregnant Chinese Holstein heifers aged 22 months was measured during standing and walking at two different speeds. The experiments were conducted in 0700-0800h each day. After measurements during standing, the mask system was fixed to the back of the cows. The expired air was collected during walking. The collection period was about 2.5 minutes. The energy cost of walking was 0.33 cal/kg W per m travelled and 0.46 cal/kg W per m at speeds of 0.95 m/sec and 1.54 m/sec . respectively. There was a significant effect of speed on energy expenditure.

BROUWER, E. (1965). In: "Energy Metabolism of Farm Animals" (ed. K.L. Blaxter) pp. 441-443 (Academic Press: London).

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